

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

# PCT

<b>To:</b> MAIWALD PATENTANWALTS GMBH Attn. Huenges, Martin Elisenhof Elisenstrasse 3 80335 München GERMANY	
MAIWALD Patentanwalts GmbH  20. Juli 2005  MÜNCHEN FRIST 19.09.	88

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT AND  
THE WRITTEN OPINION OF THE INTERNATIONAL  
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference N 7198 / KK	Date of mailing (day/month/year) 19/07/2005
International application No. PCT/EP2004/014797	International filing date (day/month/year) 29/12/2004
Applicant NCTENGINEERING GMBH	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes  
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

**4. Reminders**


Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  Cora Dreyer
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## NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

### INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the International Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*, Annexes B1 and B2).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the International Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, Volume I/A, paragraph 296).

#### What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

#### When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

#### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

#### How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

#### What documents must/may accompany the amendments?

##### Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference N 7198 / KK	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/EP2004/014797	International filing date (day/month/year) 29/12/2004	(Earliest) Priority Date (day/month/year) 30/12/2003
Applicant  NCTENGINEERING GMBH		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 6 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (See Box II).

3. ☒ Unity of invention is lacking (see Box III).

## 4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

## 5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

## 6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 71b

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/014797

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01L3/10 G01L1/12 G01L3/14 G01L25/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 581 480 B1 (MAY LUTZ AXEL ET AL) 24 June 2003 (2003-06-24)	1,2,4, 10,12, 13,15, 16,22,23
Y	abstract; figure 5b	3,5-8, 37-39
A	column 10, line 20 - line 36  column 17, line 58 - line 61 -----	9,11,14, 17-21, 24-27,40
Y	WO 01/79801 A (FAST TECHNOLOGY AG; MAY, LUTZ, AXEL) 25 October 2001 (2001-10-25) abstract; figure 2b page 3, line 1 - line 10	5,6,8,35
A	page 11, line 17 - page 16, line 3 page 27, line 23 - page 29, line 3 ----- -/--	1-4,7, 9-27,40

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

20 June 2005

Date of mailing of the international search report

19.07.2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Helm, B

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/014797

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 95/33982 A (GARSHELIS, IVAN, J) 14 December 1995 (1995-12-14) abstract; figures 32-35 page 52, line 20 - page 53, line 23 -----	3,7
X	WO 00/57150 A (FAST TECHNOLOGY GMBH; MAY, LUTZ, AXEL; OWSLEY, JOHN) 28 September 2000 (2000-09-28)	28-34, 36,41
Y	abstract; figures 6-13 page 6, line 16 - line 27 page 9, line 11 - page 10, line 28 page 12, line 10 - line 12 page 13, line 11 - page 14, line 3 page 15, line 15 - line 22 page 16, line 22 - page 17, line 22 page 19, line 7 - page 20, line 5 page 21, line 12 - line 14 page 22, line 20 - line 22 -----	35,37-39

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2004/014797

## Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-27,40

Magnetizing at least one of two objects, one object enclosing the other, wherein an electrical signal source is adapted to apply an electrical signal to the enclosed object so that at least a portion of the one object and/or of the other object is magnetized.

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2. claims: 28-39,41

Calibrating a force and torque sensor device, having a magnetically encoded region on an object and a magnetic field detector adapted to detect a signal resulting from a force or a torque applied to the object, wherein a pre-known force generating element is adapted to apply a pre-known force to the object, and wherein a calibrating unit is adapted to calibrate the force and torque sensor device based on a correlation between the pre-known force and a detected signal resulting from the pre-known force.

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/014797

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6581480	B1	24-06-2003	AU 2739999 A 16-11-1999
		EP 1070237 A1 24-01-2001	
		WO 9956099 A1 04-11-1999	
		JP 2002513147 T 08-05-2002	
WO 0179801	A	25-10-2001	AU 5832101 A 30-10-2001
		WO 0179801 A2 25-10-2001	
		EP 1282810 A2 12-02-2003	
		JP 2003531368 T 21-10-2003	
		US 2003150282 A1 14-08-2003	
WO 9533982	A	14-12-1995	US 5520059 A 28-05-1996
		CA 2190974 A1 14-12-1995	
		DE 69527983 D1 02-10-2002	
		DE 69527983 T2 28-05-2003	
		EP 0803053 A1 29-10-1997	
		JP 2914526 B2 05-07-1999	
		JP 9511832 T 25-11-1997	
		WO 9533982 A1 14-12-1995	
		US 5591925 A 07-01-1997	
		US 5708216 A 13-01-1998	
WO 0057150	A	28-09-2000	AU 3442300 A 09-10-2000
		EP 1169627 A1 09-01-2002	
		WO 0057150 A1 28-09-2000	
		JP 2002540392 T 26-11-2002	



# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

To:

see form PCT/ISA/220  
**MAIWALD**  
Patentanwalts GmbH

**20. Juli 2005**

MÜNCHEN

FRIST

30.10.

08

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/EP2004/014797

International filing date (day/month/year)  
29.12.2004

Priority date (day/month/year)  
30.12.2003

International Patent Classification (IPC) or both national classification and IPC  
G01L3/10, G01L1/12, G01L3/14, G01L25/00

Applicant  
NCTENGINEERING GMBH

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office  
D-80298 Munich  
Tel. +49 89 2399 - 0 Tx: 523656 epmu d  
Fax: +49 89 2399 - 4465

Authorized Officer

Helm, B

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10/585012

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/EP2004/014797

1AP20 Rec'd 17 JUN 2006

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/EP2004/014797

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**Box No. IV Lack of unity of invention**

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1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☒ paid additional fees.
  - ☐ paid additional fees under protest.
  - ☐ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
  - ☒ not complied with for the following reasons:  
**see separate sheet**
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☒ all parts.
  - ☐ the parts relating to claims Nos.

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	3, 5-9, 11, 14, 17-21, 24-41
	No: Claims	1, 2, 4, 10, 12, 13, 15, 16, 22, 23
Inventive step (IS)	Yes: Claims	
	No: Claims	1-41
Industrial applicability (IA)	Yes: Claims	1-41
	No: Claims	

2. Citations and explanations

**see separate sheet**

## **Prior Art**

Reference is made to the following documents:

- D1 = US-B1-6 581 480 (MAY LUTZ AXEL ET AL) 24 June 2003 (2003-06-24)
- D2 = WO 01/79801 A (FAST TECHNOLOGY AG; MAY, LUTZ, AXEL) 25 October 2001 (2001-10-25)
- D3 = WO 95/33982 A (GARSHELIS, IVAN, J) 14 December 1995 (1995-12-14)
- D4 = WO 00/57150 A (FAST TECHNOLOGY GMBH; MAY, LUTZ, AXEL; OWSLEY, JOHN) 28 September 2000 (2000-09-28)

## **Re Item IV.**

1. This Authority considers that there are 2 inventions covered by the claims indicated as follows:
  - I. Claims 1 to 27, 40: Magnetizing at least one of two objects, one object enclosing the other, wherein an electrical signal source is adapted to apply an electrical signal to the enclosed object so that at least a portion of the one object and/or of the other object is magnetized.
  - II. Claims 28 to 39, 41: Calibrating a force and torque sensor device, having a magnetically encoded region on an object and a magnetic field detector adapted to detect a signal resulting from a force or a torque applied to the object, wherein a pre-known force generating element is adapted to apply a pre-known force to the object, and wherein a calibrating unit is adapted to calibrate the force and torque sensor device based on a correlation between the pre-known force and a detected signal resulting from the pre-known force.
2. The reasons for which the inventions are not so linked as to form a single general inventive concept, as required by Rule 13.1 PCT, are as follows:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING  
AUTHORITY (SEPARATE SHEET)**

PCT/EP2004/014797

3. The closest prior art at hand with respect to both groups of inventions has been identified as document D1 and discloses (see e.g. passages cited in the report indicating the results of the International Search) an apparatus for and a method of measuring torque comprising a torque measuring shaft rotatable about a longitudinal axis, said shaft comprising first and second zones disposed along the longitudinal axis and each being magnetised.
4. As it is immediately apparent from independent claims 1, 10 on the one hand and 28, 29 on the other hand, the only common feature of these claims is an object having a magnetized region. However, as mentioned above, such an object is disclosed in document D1.
5. The remaining features of independent claims 1 and 10 relate to a set of two objects, one object enclosing the other, wherein an electrical signal source is adapted to apply an electrical signal to the enclosed object. Thus, a magnetized region is achieved in one or both objects and a sensor comprising said object can be manufactured and operated at low cost (technical effect).
6. The remaining features of independent claims 28 and 29 relate to the calibration of a magnetic force and torque sensor device, wherein a pre-known force generating element is adapted to apply a pre-known force, and wherein a calibrating unit is adapted to calibrate the force and torque sensor device based on a correlation between the pre-known force and a detected signal resulting from the pre-known force. Thus, an accurate and reliable force and torque sensor device is provided, where, e.g., the outputs at zero-output are not masked by noise (technical effect).
7. This appears to show lack of corresponding technical effect as well. Consequently, the requisite unity of invention (Rule 13.1 PCT) therefore no longer exists inasmuch as a technical relationship involving one or more of the same or corresponding special technical features in the sense of Rule 13.2 PCT does not exist between the subject-matter of the above mentioned groups of claims.  
In conclusion, these groups of claims define two different inventions not linked by a single general inventive concept. The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

## **Re Item V.**

### **1. Objections under Article 33(2) PCT (Novelty)**

- 1.1. The present application does not satisfy the criterion set forth in Article 33(2) PCT because the subject-matter of claims 1, 2, 4, 10, 12, 13, 15, 16, 22 and 23 is not new in respect of prior art as defined in the regulations (Rule 64(1)-(3) PCT).
- 1.2. Document D1 (see paragraphs above), further discloses (see e.g. passages cited in the report indicating the results of the International Search) a shaft 10 as a second object and a set of two electrodes 62 as a first object enclosing the second object. In order to generate a circumferential magnetic field in the shaft 10, a direct current pulse 60 is passed longitudinally through the shaft 10. The current can be made to flow either through the whole shaft or through portions of it. In the latter case the current 60 is applied through said ring electrodes 62 attached to the shaft. The direction of the field depends on the polarity of the current.  
Therefore, claims 1, 2, 4, 10, 12, 13, 15, 16, 22 and 23 are not novel.

### **2. Objections under Article 33(3) PCT (Inventive Step)**

- 2.1. The present application does not satisfy the criterion set forth in Article 33(3) PCT because the subject-matter of claims 3, 5 to 9, 11, 14, 17 to 21 and 24 to 41 does not involve an inventive step (Rule 65(1),(2)) PCT.
- 2.2. Claims 3, 5 to 9, 11, 14, 17 to 21, 24 to 27, 30 to 39 only suggest slight changes to the arrangements of the independent claims to which they refer. These changes are regarded as being within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can be readily contemplated in advance.

- 2.3. In particular, document D2 suggests in an "Electromagnet Alternative" for generating an annulus of longitudinal magnetisation in an integral portion of a shaft. The result of this magnetisation is to produce a surface adjacent annular magnetised zone 16 within which an interior annular magnetised zone 18 of opposite polarity is established. These two zones combine to provide a torus of closed loop magnetic flux. Thus, claims 5, 6 and 8 do not involve an inventive step, either. Moreover, according to said "Electromagnet Alternative", document D2 proposes the application of a ramped signal having different raising and falling edges. The selection of appropriate raising and falling edges, however, is a matter of straightforward trial and error routine experiments from which the skilled person would select suitable values, in accordance with circumstances, without the exercise of inventive skill. Thus, also claims 3 and 7 do not involve an inventive step.
- 2.4. Document D3 discloses a magnetisation process, wherein a conductor 172 passes coaxially through a ring or hollow tube 178 which is successively immersed into a conductive liquid 176; e.g. mercury. Therefore, claims 11, 20 and 21 do not involve an inventive step.
- 2.5. Document D4 (see e.g. passages cited in the International Search Report) describes a shaft, wherein a longitudinal magnetisation has in a radial direction of the shaft a surface adjacent annular magnetised zone 154 within which an interior annular magnetised zone 156 of opposite polarity is established. The two zones combine to provide a torus of closed loop magnetic flux. The magnetisation is obtained by a two-step procedure. Firstly a deep annular region of the polarity of zone 156 is formed by the magnet 150. Then the surface adjacent zone 154 is formed by reversing the magnetisation polarity of the surface adjacent region of the deep region. According to document D4 (page 21, lines 11 to 14), the principles given "above" (i.e. on pages 1 to 20 of document D4) can be applied to radially spaced circumferential magnetisations which find particular, though not exclusive, application in torque transmitting discs. Moreover, document D4 mentions that circumferential magnetisations can be achieved with a shaft being subjected to an axially directed current (see e.g. page 9, lines 3 to 20). In order to create the concentric circumferential magnetisations as shown in figure 13 of document D4 in a shaft instead of a disc, the skilled person would also consider to subject the shaft to a plurality of axially directed current pulses of different polarities and

waveforms.

In particular, said indication that "the principles given above can be applied to radially spaced circumferential magnetisations which find application also in other arrangements but discs", would prompt the skilled person to apply such an "above principle" as the application of axially directed currents in order to achieve radially spaced circumferential magnetisations in a shaft.

Moreover, according to document D4 (see e.g. page 6, lines 15 to 27), the circumferential field is induced in the transducer element when the element is subject to a torque, according to the so-called *pre-torquing concept*. Thus, the provision of a real measurable output at zero torque with a range of linear measurement of magnetic field output against applied torque is enabled.

In addition, document D4 discloses a processing circuit 40 for processing the signals from sensors 36 and 38 having respective voltages V1 and V2 induced in them. The sensors are mounted to have the voltages V1 and V2 induced in the same sense and to have any signal due to the earth's magnetic field or other extraneous field induced in the same sense. The signals are subtracted and the result is multiplied by a factor "k":

$$V_0 = k (V_1 - V_2)$$

Thus, any unwanted signal components, such as from the earth's magnetic field are cancelled from the final output.

In addition, document D4 describes a multiple field arrangement as the basis of an *automatic gain control or calibration* for a torque sensor system. For example, if in the situation of Fig. 6a the two output signals are summed, the sum should be a constant value at all torques. Over time the circumferential fields may weaken so that if an initial sum value is stored as a calibration point, the later obtained instantaneous sum can be compared with said initial sum value and used to derive a compensating value to correct later sensor measurements.

Thus, claims 28 to 34, 36 and 41 do not contribute to inventive step.

- 2.6. As described above in the context of document D1, the features described in present claims 35 and 37 to 39 cannot be considered to involve an inventive step.

### 3. Articles 33(1),(4) PCT (Industrial Applicability)



Beyond any doubts, the subject-matter defined in claims 1 to 27 and 40 is industrially applicable, e.g. in commercially available torque sensors and their manufacturing.

#### 4. Further Objections and Remarks

- 4.1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the **documents D1 to D4** is not mentioned in the description, nor are these documents identified therein.
- 4.2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).